

ICPDR's Climate Change Adaptation Strategy and planned work on droughts



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METEET Workshop on Climate Resilience
of Inland Waterways and Ports

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Online



International Commission
for the Protection
of the Danube River
Internationale Kommission
zum Schutz der Donau

The Danube River Basin



Danube River Basin District Overview

DRBMP Update 2021 - MAP 1



This ICPDR product is based on national information provided by the Contracting Parties to the ICPDR (AT, BA, BG, CZ, DE, HR, HU, MD, ME, RO, RS, SI, SK, UA) and CH. EuroGlobalMap data from EuroGeographics was used for all national borders except for AL, BA, ME where the data from the ESRI World Countries was used. Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System was used as elevation data layer; data from the European Commission (Joint Research Center) was used for the outer border of the DRBD of AL, IT, ME and PL.

Vienna, November 2021

- 800.000 km²
- 19 countries
- 79 million people
- High diversity - contracting parties to the ICPDR
 - 9 EU Member States
 - 5 Non-EU Member States



ICPDR IKSD

International Commission
for the Protection
of the Danube River

Internationale Kommission
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The ICPDR's Response to Danube Pressures

Aligned to the Danube River Protection Convention,
the EU Water Framework Directive and EU Floods Directive



Künzelmann, UFZ

Transnational Monitoring



ICPDR/Mello

Greener Navigation



Climate Change Strategy

**Climate Change is being
addressed jointly
in the DRB**

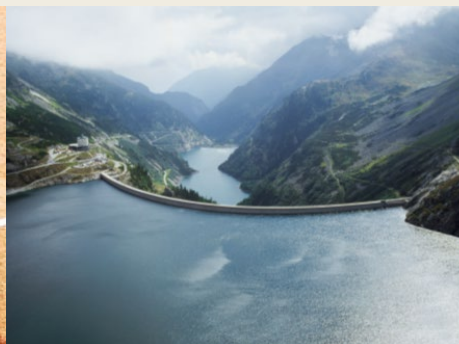


Künzelmann, UFZ

Joint Danube Survey



Accident Warning System



Sustainable Hydropower



Sustainable Agriculture



Achievements since 1st Danube RBM Plan (2009)



61,745
hectares of
wetlands &
floodplains
reconnected



127
fish migration aids
constructed

- 60%
organic
emission



- 30% nitrogen
emissions

- 50%
phosphorous
emissions

58
river restoration
projects
completed



Climate Change in the DRB: What happens in the DRB?



Ecological Status and Ecological Potential of Surface Water Bodies

DRBMP Update 2021 - MAP 23



On transboundary river water bodies, status of surface water bodies is reported separately for each country and may differ from each other. In case of overlapping symbols, they are drawn on top of each other, in this order: higher confidence is shown on top, and in case that status assessments have the same confidence, the following ranking should be applied (top to bottom): Bad - Poor - Moderate - Good - High - Unknown. In case that assessments have the same confidence and status, the following ranking should be applied (top to bottom): Artificial - Heavily Modified (Final then Provisional) - Natural (Final then Provisional) - No designation performed. This ICPDR product is based on national information provided by the Contracting Parties to the ICPDR (AT, BA, BG, CZ, DE, HR, HU, MD, ME, RO, RS, SI, SK, UA) and CH. EuroGlobalMap data from EuroGeographics was used for all national borders except for AL, BA, ME where the data from the ESRI World Countries was used. Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System was used as elevation data layer; data from the European Commission (Joint Research Center) was used for the outer border of the DRB of AL, IT, ME and PL.

Vienna, November 2021

Overview on water status across the whole basin as part of the Danube RBM Plan (EU WFD)

- The assessments currently includes possible negative impacts of CC
- Understand CC effects per se in a better, more holistic way to ensure efficient adaptation
- Enable effective mitigation



Climate Change in the DRB: What happens in the DRB?



- Climate change effects are increasing in the DRB
 - Increased extreme events – droughts & floods
 - Extreme ice event in 2017
 - Drought and low water levels in 2022/2023
- **Action towards climate and water resilience are needed**

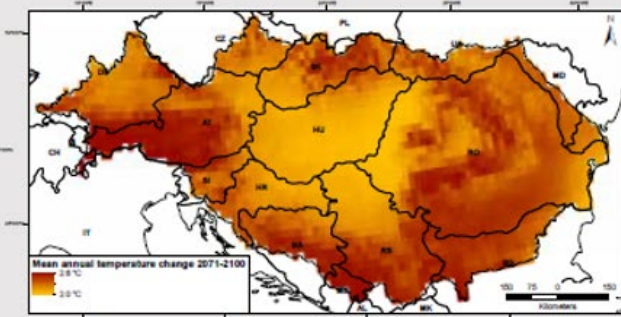
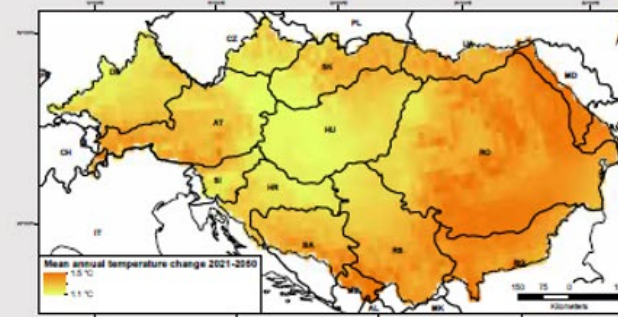


Climate Change Scenarios in the DRB

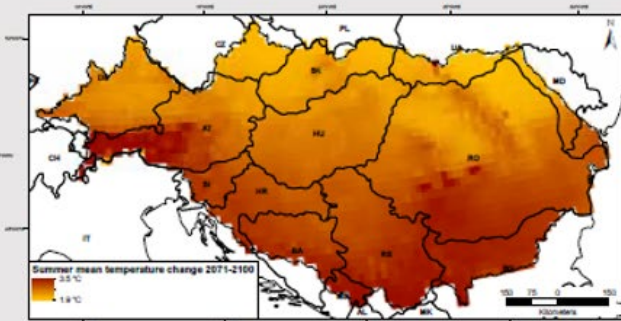
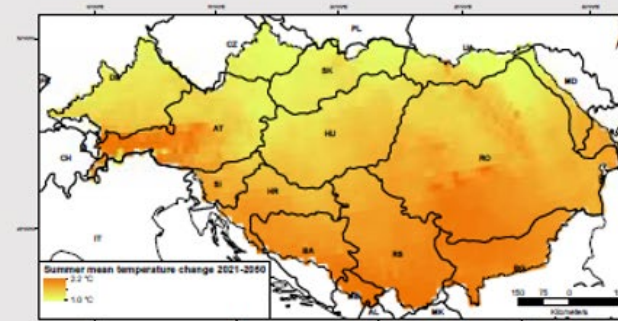
Changes for annual, summer mean and winter mean temperatures according to the Representative Concentration Pathways 4.5 of the EURO-CORDEX ensemble results (*Status 2018*)

2021-2050

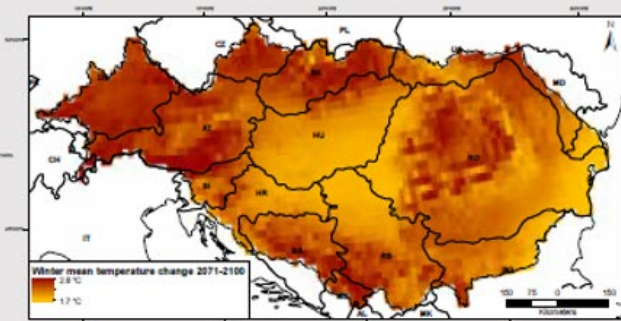
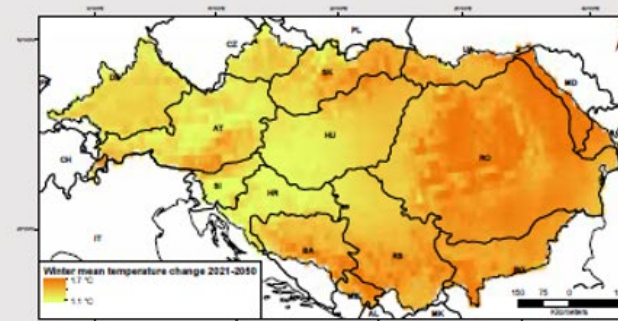
2071-2100



Annual mean temperature changes



Summer mean temperature changes

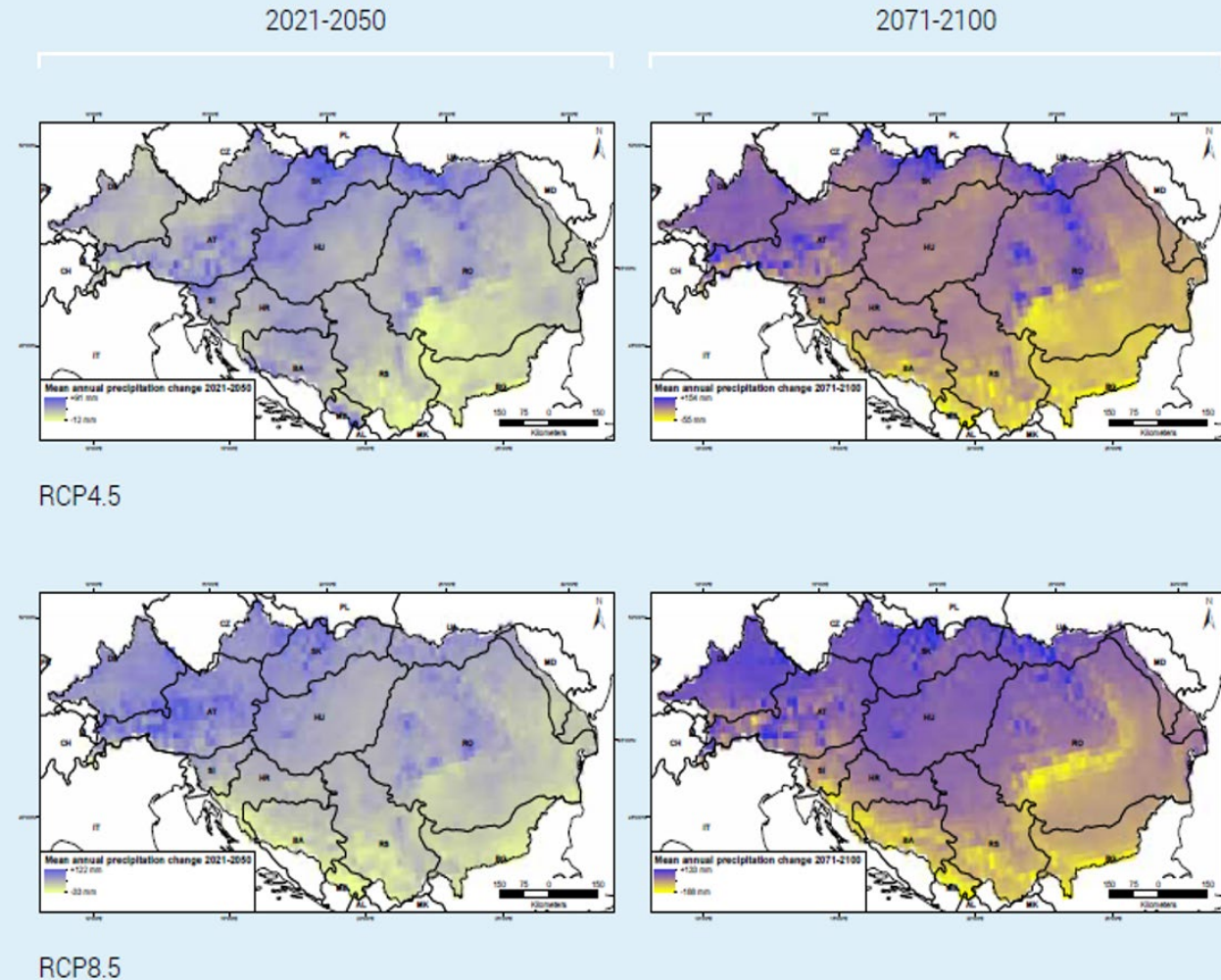


Winter mean temperature changes

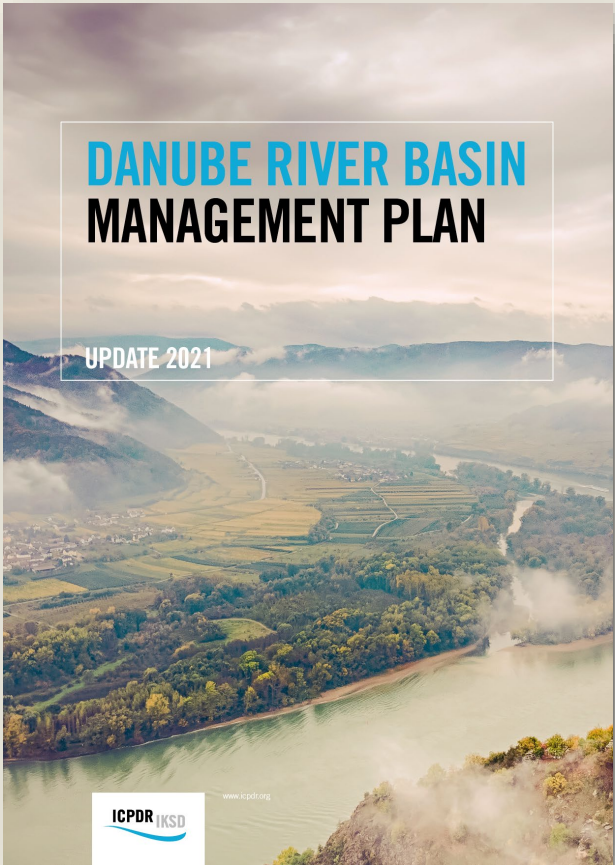
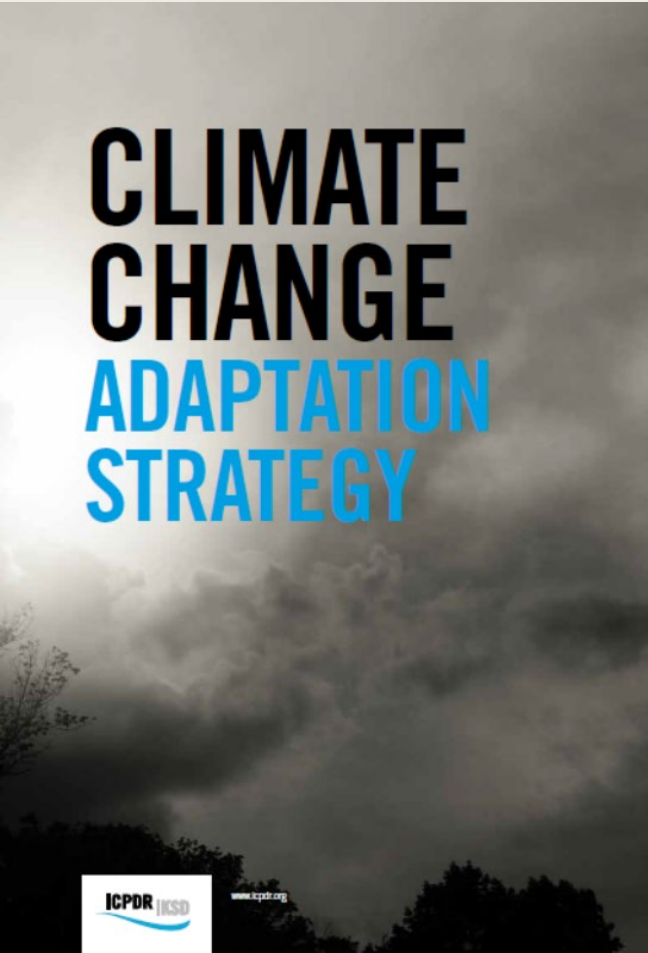
Climate Change Scenarios in the DRB



Changes of **mean annual precipitation** for periods 2021-2050 and 2071-2100 according to the Representative Concentration Pathways 4.5 and 8.5 of the EURO-CORDEX ensemble results (*Status 2018*)



Addressing Climate Change & Adaptation in the DRB



Several other supporting activities (e.g. Hydrological Information System; planned water balance; etc)

Addressing Climate Change & Adaptation in the DRB



CLIMATE CHANGE ADAPTATION STRATEGY

Leading and pioneering RBO regarding CC adaptation

ICPDR CC Adaptation Strategy 2012 & update 2018:

- **Guides** how to integrate CC adaptation into overall ICPDR planning & management processes
- **Supports action** in transboundary context: **Tool-box of measures**
- **Influences and feeds into** national strategies and actions

Projected Climate Change Impacts in DRB

Legend

- Beneficial change
- Adverse change
- Change neither beneficial nor adverse/small change



Increase throughout most of a region
 Decrease throughout most of a region
 Increase in substantial parts of a region
 Decrease in substantial parts of a region
 Increase as well as decrease in a region
 Only small changes
 No information (empty cell)

Sector

Changes in the climate system

UDRB Upper Danube River Basin
 MDRB Middle Danube River Basin
 LDRB Lower Danube River Basin
 DRB Danube River Basin

Mean annual air temperature



Mean summer air temperature



Mean winter air temperature



Mean annual precipitation



Mean summer precipitation



Mean winter precipitation



Heat extremes

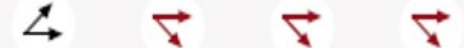


Extreme precipitation



Changes in discharge / water availability

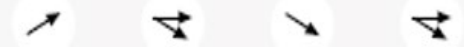
Mean annual discharge



Average summer discharge



Average winter discharge



Timing of the annual peak flow



Projected Climate Change Impacts in DRB

Legend

- Beneficial change
- Adverse change
- Change neither beneficial nor adverse/small change



Increase throughout most of a region
Decrease throughout most of a region
Increase in substantial parts of a region
Decrease in substantial parts of a region
Increase as well as decrease in a region
Only small changes
No information (empty cell)

Sector	UDRB Upper Danube River Basin	MDRB Middle Danube River Basin	LDRB Lower Danube River Basin	DRB Danube River Basin
Changes in droughts and low/flows				
Drought				
Low flow				
Changes in floods				
Floods				
Changes in agriculture				
Growing season				
Damage from extreme events				
Reliable production				
Water demand				
Invasive species/pests				
New species/shift				
Changes in forestry				
Growing season				
Forest fires				
Structure and stability				
New species/shift				

Projected Climate Change Impacts

Legend

- Beneficial change
- Adverse change
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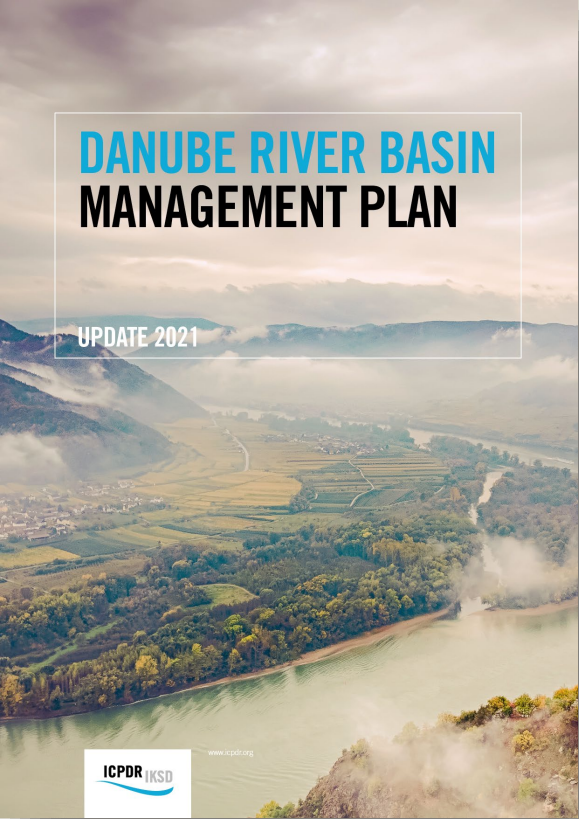


Sector	UDRB Upper Danube River Basin	MDRB Middle Danube River Basin	LDRB Lower Danube River Basin	DRB Danube River Basin
Changes in biodiversity/ecosystems				
Number of native species				
Number of invasive species				
Water temperature				
Shift of habitats				
Vulnerability to changes in discharge				
Changes in water-related energy production				
Hydropower potential				
Thermal electricity potential				
Changes in navigation				
Ice cover				
Low flow conditions				

Climate Change & the Danube RBM Plan



5 DRB Significant Water Management Issues



Organic
Pollution



Nutrient
Pollution



Hazardous Subst
Pollution



Hydromorphological
Alterations



Effects of Climate
Change (drought,
water scarcity,
extreme hydrological
phenomena and other
impacts)

Climate Change Effects as SWMI

Climate Change & the Danube RBM Plan



DANUBE RIVER BASIN MANAGEMENT PLAN

UPDATE 2021

ICPDR IKSD



Effects of Climate
Change (drought,
water scarcity,
extreme hydrological
phenomena and other
impacts)

SWMI Climate Change Effects to:

- **Respond** to increasing effects from CC
- **Assess** possible/additional negative impacts from CC
 - Surface waters and groundwater
- **React and identify** possible adaptation measures/actions
- **Consider/integrate** affected water uses in the DRB
 - This includes infrastructure and morphological measures
 - Stakeholder involvement

Climate Change & Drought in the DRB

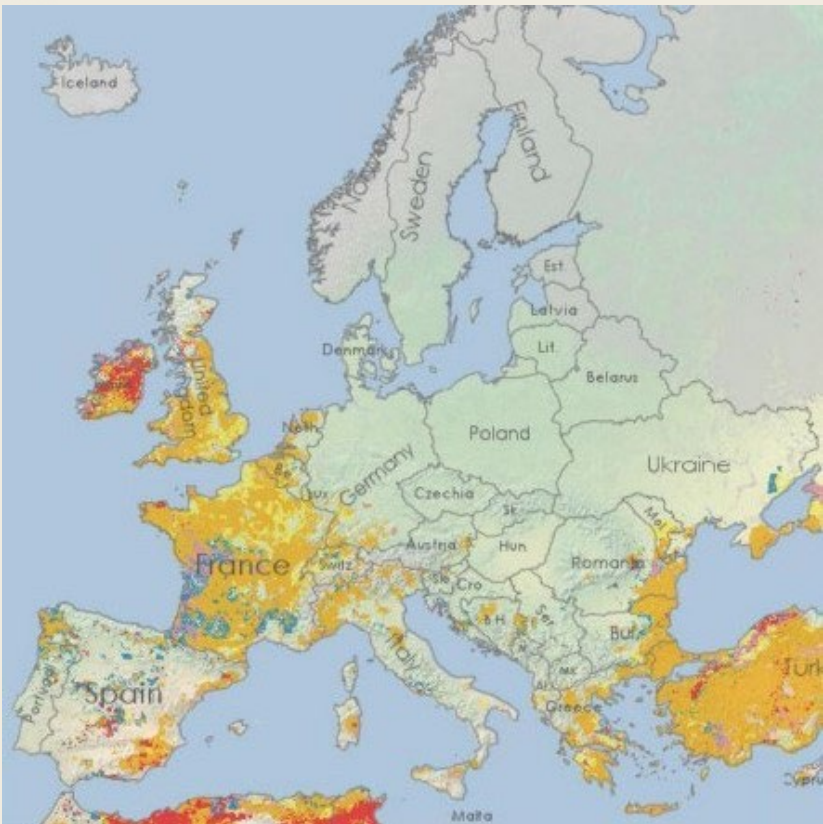
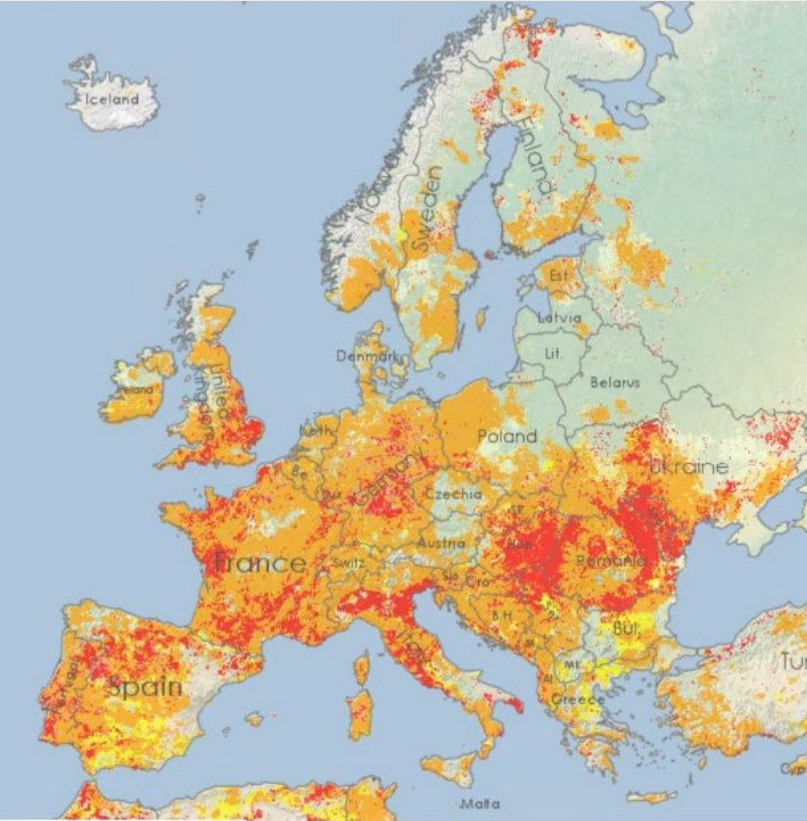


- Clear trend in increasing temperatures and less precipitation over last 30 years
 - In number and intensity
 - Across Europe including the DRB
- Drought events and low flows in rivers became increasingly frequent
- Economic losses are linked to drought events
- Severe droughts in the DRB since the beginning of 2022
- Further expansion of droughts / worsening early August 2022
 - Due to combination of lacking precipitation and heat waves as of May 2022
- Discharges across Europe were affected including the DRB
- Trends continued through winter 2022/2023

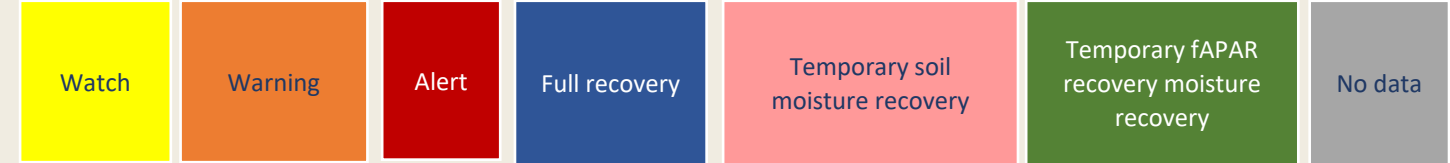


Climate Change & Drought in the DRB

Combined Drought Indicator (combination of precipitation, soil moisture and vegetation conditions) for August 2022 (left) and March 2023 (right).



JRC (2022 & 2023), Drought in Europe



Climate Change & Drought in the DRB

LFI – Low Flow Index beginning of August 2022

Value 0: No drought

Value 1: highest drought hazard






JRC (2022), Drought in Europe August 2022

Consequences of drought:

- Impacts on ecosystems / aquatic and terrestrial
- Impacts on water uses, e.g.
 - Reduced stored water volume with impacts on hydropower
 - Low water levels with impacts on navigation
- Reduced summer crops' yield

Climate Change & Water Users







Development of Inland Navigation and Environmental Protection in the Danube River Basin

Joint Statement on Guiding Principles

Inland navigation can contribute to making transport more environmentally sustainable, particularly where it substitutes for road transport. It can, however, also have significant influence on river ecosystems, jeopardizing the goals of the EU Water Framework Directive, which aims for the "good ecological status" of all waters by 2015. Recognising this potential conflict in a number of new waterway projects along the Danube and the Sava river, the International Commission for the Protection of the Danube River (ICPDR) has linked up with the Danube Navigation Commission, and the International Sava River Basin Commission to conduct in 2007 an intense, cross-sectoral discussion process. As a result of 3 interdisciplinary workshops, a "Joint Statement on Guiding Principles on the Development of Inland Navigation and Environmental Protection in the Danube River Basin" was agreed. The final document was adopted in December 2007/January 2008 by the ICPDR, the Danube Commission and by the International Sava River Basin Commission. The "Joint Statement" is a guiding document for the maintenance of existing waterways and the development of future waterway infrastructure. It is perceived as a milestone that leads to the integration of ecology into waterway development.

Deutschland // Österreich // Tschechien // Slowakei // Ungarn // Rumänien // Serbien // Bosnien und Herzegowina // Kroatien // Montenegro // Albanien // Mazedonien // Bulgarien // Griechenland



Sustainable Hydropower Development in the Danube Basin

Guiding Principles

Deutschland // Österreich // Tschechien // Slowakei // Ungarn // Rumänien // Serbien // Bosnien und Herzegowina // Kroatien // Montenegro // Albanien // Mazedonien // Bulgarien // Griechenland

THE NUTRIENTS AND DROUGHT ISSUE

POLICY PAPER ON SUSTAINABLE AGRICULTURE IN THE DANUBE RIVER BASIN

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Drought & Water Users



- **Aim:** Ensure Climate and Water Resilience
- Possible impacts from climate change – environment and water uses:
 - Stakeholder involvement is essential
- Linkage between management and water users (navigation; agriculture; hydropower)
 - Joint approach towards consensus
 - Find joint solutions considering economic development AND environmental requirements
- **In case of inland navigation:**
 - Meet the aims of the Joint Statement on Navigation/Environment
 - Planned update of the Joint Statement also addressing the changing climate and river dynamics in the DRB with technical actions and solutions
 - Innovative and integrative approaches with the potential to adapt flexibly to quickly changing climate conditions

ICPDR Activities on Drought

- Discussion at 25th Ordinary Meeting in December 2022 and 21st Standing Working Group (15 June 2023)
- **Drought and low water is considered as important** as important for further action by the ICPDR
- **Internal ICPDR Workshop on Drought and Low Water Level in the DRB**
 - 16 June 2023 in Belgrade/Serbia
 - Aim: understand and identify DRB transboundary needs regarding droughts/low water levels to put forward possible actions on the ICPDR level to tackle these needs
 - Next steps will be identified
- Likely **develop overview on approaches, activities and policies** regarding drought/low water in the ICPDR countries (considering activities within other RBOs and under the EU CIS)
- **2023/2024: Plan and Implement process to update the Joint Statement** also addressing climate change and drought accordingly



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Possible Next Steps



- **Increase knowledge** for well-informed Climate Change adaptation and ensure action
- **Identify a way forward** to better understand drought dynamics and implications in the DRB
- **Integrated assessment of CC** in future Danube RBM Plan and Flood Risk Management Plan
- **Further stakeholder and sector involvement** to ensure holistic Climate Change adaptation and effective measures

Thank You For Your Attention!



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